2017 Field Study to Update Alberta Upstream Oil and Gas Equipment, Component & Fugitive Factors

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2017 Alberta Field Study

- Funded by NRCan and authorized by AER.
- Improve confidence in methane emission inventory:
  - Field counts of process equipment, components and pneumatic devices.
  - Update leak factors.
- Focused on sites and sources contributing the most to methane emission uncertainty (in 2011 Upstream Oil & Gas National Inventory).
  - Wells, batteries and compressor stations.
- Conducted at 333 randomly selected locations operated by 63 different companies.
2017 Alberta Field Study

- Snap-shot in time representing the vintage, production characteristics and regulatory oversight in Alberta during 2017.

- Facilities and wells correlated with active Petrinex identifiers (using measurement schematics) to align results with a regulated data model.
Data Collection & Analysis

- Sampling plan with clear definitions (leak vs vent, OEL vs PRV, etc) and standardized data collection methods.
- Field counts and OGI leak surveys led by Greenpath Energy Ltd.
- Three days of desktop and on-site training with extensive QAQC activities.
- Factors and confidence intervals determined by using the Bootstrapping Method.
  - Considered uncertainty arising from inaccuracy in measuring devices, repeatability of counts, OGI method effectiveness and random variation in quantities measured.
End use:
- AER D060 regulatory impact assessment.
- National Emission Inventory for Upstream Oil and Gas.

Final report has 6 types of factors to characterize key methane sources:
- Process equipment count per facility subtype or well status code.
- Component count per process equipment unit.
- Emission control type per process equipment unit.
- Pneumatic device count per facility subtype or well status code by device & driver types.
- Population average leak rate per component and service type.
- Leaker rate per component and service type.
Fugitive Emission Results

Highly skewed leak distribution:

- Top 10 sites emit ~65% of total leak rate.
- Similar skewed distributions observed by other researchers.
- Single largest leak (SCVF) emits ~35% of total leak rate.

SCVF repaired per AER ID 2003-1

+260 sites
Are Fugitive Emissions Increasing or Decreasing?

- Comparison with 2005 and 2014 CAPP Leak Factor Publications:

  **2017 and 2014 equipment leaks about the same and ~60% less than 2005 emissions.**
Importance of Fugitive Emissions versus Venting

- Venting estimated using emission factors (pneumatics & dehydrators) and OGI videos (tanks and unlit flares).
  - Basis for **qualitative** comparisons.
  - Large uncertainty acknowledged.

- Classify emission sources according to AER D060 categories
Venting = 80% of cumulative release rate

Equipment Leaks = 8% of cumulative release rate
Average Fugitive & Venting By Facility Type

Focus Mitigation on Oil Batteries & Compressor Stations

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>Average Gas Release Rate (m³/day/site)</th>
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<tbody>
<tr>
<td>Compressor Station Equipment (Average)</td>
<td></td>
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<tr>
<td>0.4 Dehydrators</td>
<td></td>
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<tr>
<td>0.3 HC Tanks</td>
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<tr>
<td>0.8 Separators</td>
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<tr>
<td>1.1 Compressors</td>
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<tr>
<td>Heavy Oil Battery Equipment (Average)</td>
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<tr>
<td>1.4 HC Tanks</td>
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<tr>
<td>0.9 Compressors</td>
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<tr>
<td>Oil Battery Equipment (Average)</td>
<td></td>
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<tr>
<td>0.3 Line Heaters</td>
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<tr>
<td>2.6 HC Tanks</td>
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<tr>
<td>2.4 Separators</td>
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<tr>
<td>0.5 Treaters</td>
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<tr>
<td>0.5 Compressors</td>
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<tr>
<td>Gas Battery Equipment (Average)</td>
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<tr>
<td>0.3 HC Tanks</td>
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<tr>
<td>0.6 Separators</td>
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<tr>
<td>0.2 Compressors</td>
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</tbody>
</table>
Average Fugitive & Venting By Well Type

- Vent - Production Casing
- Vent - Other
- Vent - HC Tank
- Vent - Pneumatic
- Fugitive - SCVF
- Fugitive - Equipment Leaks

Average Gas Release Rate (sm³/day/site)

- Gas Well Equipment (Average)
  - 0.2 HC Tanks
  - 0.4 Separators
- Oil Well Equipment (Average)
  - 0.2 HC Tanks
  - 0.2 Separators
  - 0.6 Well Pumps
- Heavy Oil Well Equipment (Average)
  - 0.3 HC Tanks
  - 1.0 Well Pumps
Thank you

Full Report:
https://www.aer.ca/providing-information/by-topic/methane/reports-and-studies